FORM PTO 1390 (REV 5-93) US DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY DOCKET NUMBER 177/529398

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. §371

U.S. APPLICATION NO. (if known, see 37 CFR 1.5) NEW 09/147938

International Application No.	International Filing Date	Priority Date Claimed
PCT/JP98/03450	August 4, 1998	August 15, 1997

Title of Invention
MANNOSE-CONTAINING FEED AND PROCESS FOR PRODUCING THE SAME

Applicant(s) For DO/EO/US
Genichi YOSHIKAWA, Akemi MORIMOTO and Munehiko DOMBO

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. [X] This is a **FIRST** submission of items concerning a filing under 35 U.S.C. §371.

2. [] This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. §371.

3. [] This express request to begin national examination procedures (35 U.S.C. §371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. §371(b) and PCT Articles 22 and 39(1).

4. [] A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.

5. [X] A copy of the International Application as filed (35 U.S.C. §371(c)(2))
   a. [] is transmitted herewith (required only if not transmitted by the International Bureau).
   b. [X] has been transmitted by the International Bureau.
   c. [] is not required, as the application was filed in the United States Receiving Office (RO/US)

6. [X] A translation of the International Application into English (35 U.S.C. §371(c)(2)). **ATTACHMENT A**

7. [] Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. §371(c)(3)).
   a. [] are transmitted herewith (required only if not transmitted by the International Bureau).
   b. [] have been transmitted by the International Bureau.
   c. [] have not been made; however, the time limit for making such amendments has NOT expired.
   d. [] have not been made and will not be made.

8. [X] An oath or declaration of the inventor(s) (35 U.S.C. §371(c)(4)). **ATTACHMENT B**

9. [] A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. §371(c)(5)).

Items 10. to 13. below concern other document(s) or information included:

10. [X] An Information Disclosure Statement under 37 CFR 1.97 and 1.98. **ATTACHMENT C**

11. [X] An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included. **ATTACHMENT D**

12. [] A FIRST preliminary amendment.

    [] A SECOND or SUBSEQUENT preliminary amendment.

13. [X] Other items or information: **FORMS PCT/IB/301, PCT/IB/308, PCT/IB/304**

U.S. APPLICATION NO. (if known, see 37 CFR 1.5) NEW	INTERNATIONAL APPLICATION NO. PCT/JP98/03450	ATTORNEY'S DOCKET NO. 177/529398

14. [X] The following fees are submitted	CALCULATIONS	PTO USE ONLY
BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5)):		
[X] Search Report has been prepared by the EPO or JPO..... $ 840.00		
[] Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO..... $ 970.00		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$840.00	
Surcharge of $130.00 for furnishing the oath or declaration later than [] 20 [] 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	$	

Claims	Number Filed	Number Extra	Rate		
Total Claims	-20 =		X $18.00	$	
Independent Claims	- 3 =		X $78.00	$	
Multiple dependent claim(s) (if applicable)			+ $260.00	$	
TOTAL OF ABOVE CALCULATIONS =				$840.00	
Reduction by 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed. (Note 37 CFR 1.9, 1.27, 1.28)				$	
SUBTOTAL =				$840.00	
Processing fee of $130.00 for furnishing the English translation later than [] 20 [] 30 months from the earliest claimed priority date (37 CFR 1.492(f)). +				$	
TOTAL NATIONAL FEE =				$840.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). $40 per property +				$40.00	
TOTAL FEES ENCLOSED =				$880.00	
				Amount to be refunded	$
				Amount to be charged	$

a. [X] A check in the amount of $880.00 to cover the above fees is enclosed. A duplicate copy of this form is enclosed.

b. [] Please charge my Deposit Account No. 23-0975 in the amount of $_____ to cover the above fees. A duplicate copy of this sheet is enclosed

c. [] The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 23-0975. A duplicate copy of this form is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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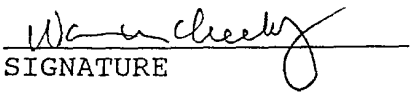
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33,367
REGISTRATION NUMBER

March 24, 1999

[CHECK NO. 32672]
[99-0325*/WMC/177]

SPECIFICATION

Mannose-containing feed and process for producing the same

Field of the Invention

The present invention relates to mannose-containing feed which has excellent handling properties and which can be produced at low cost, and to a process for producing such feed.

Description of the Prior Art

Although industrial wastes problems have been social issues for many years, a promising clue for solving the problems has not yet been found in spite of extensive efforts in various fields. Food wastes discharged from food processing factories are residues resulted from processes in which non-digestible and/or distasteful materials are removed from raw materials, and specific useful constituents are recovered for use. Since such residues contain protein, carbohydrate, fat, cellulose and the like, many of food wastes such as brewer's grains, bean curd refuse, bran, and crushed orange lees are currently used as feed. Many of these food wastes, however, have a drawback that their shelf life are short because of their high water contents. Furthermore, the appreciation of the yen promotes import of cheap feed from abroad, and there is a trend for dairy farmers in Japan to rely on such imported feed which is more easy to handle.

Copra meal, a ground product of extraction residue of coconut oil, is also mostly used in Japan as feed for cattle and swine. However, copra meal as such has a drawback that it is not suitable as feed for fowl because it contains a rather large amount of fiber and its amino acid composition is not quite acceptable ("Shiryo-No-Kiso-Chishiki", Toyo Keizai Shinpo, p. 58 (1970)).

In the meanwhile, mannose has proved to have an effect preventing harmful bacterial infection via intestinal tract, and feed which contains mannose as an ingredient for preventing infection has been proposed (Japanese Patent Publication No. H8(1996)-38064 A).

Mannose is heretofore produced by acidic or enzymatic degradation of glucomannan contained in, for example, wood or bulb of konjak or galactomannan

contained in, for example, guar gum.

However, since the process for extracting various mannans from natural sources requires complicated procedures and high costs, feed which contains mannose thus produced has a drawback of being expensive. In addition, since mannose thus produced is in the form of powder or aqueous solution, it has another drawback that it is difficult to mix mannose uniformly with feed. Furthermore, the process for extracting mannan produces a large amount of waste residue. Since this residue is not suitable for use as feed because it no longer contains useful constituents such as amino acids or sugars, it also causes another industrial wastes problems.

Disclosure of the Invention

Summary of the Invention

The present invention provides mannose-containing feed which has excellent handling properties and which can be produced easily and at low cost by using copra meal, and also provides a process for producing such feed.

Brief Description of the Drawing

Fig. 1 shows the results of measurement in which the number of salmonellae in cecal feces after forced oral administration of salmonella was determined at various times in (a) fowls received the feed of the present invention, compared with those results obtained in (b) fowls received formula feed supplemented usual copra meal without any enzymatic treatments or (c) fowls received only the base formula feed.

Description of the Preferred Embodiments

The present inventors have found that mannose-containing copra meal which is obtained by degrading at least part of mannan in copra meal to mannose is quite useful as mannose-containing feed because it exhibits excellent handling properties and can be produced easily and at low cost. The present invention has been completed on the basis of this finding.

Specifically, the gist of the first invention is a mannose-containing copra meal characterized in that mannan in the copra meal has been degraded in whole or in part to

mannose.

In addition, the gist of the second invention is a process for producing a mannose-containing copra meal, characterized in that copra meal is treated with a hemicellulase solution to release mannose.

Furthermore, the gist of the third invention is a formula feed which contains a mannose-containing copra meal.

The present invention is further described in detail below.

The mannose-containing feed of the present invention is produced using copra meal as a row material by degrading mannan in the copra meal in whole or in part to release mannose.

The term "copra meal" refers to a ground product of residues resulted from the process in which coconut oil is extracted from copra, the raw material for pressing coconut oil obtained by drying the pulp of coconut, and copra meal usually contains mannan at an amount of about 30% by weight. Copra meal which may be used as a raw material for the mannose-containing feed of the present invention is not specifically restricted in regard to its origin, producing method or the like, so far as it is produced in the usual process for producing coconut oil.

Although the degradation percent of mannan in copra meal is not specifically restricted, it is preferred that 10-100% by weight, particularly 30 to 100%, of mannan has been degraded.

The water content in the mannose-containing copra meal of the present invention is preferably 5-20% by weight, and more preferably 5-13% by weight. Copra meal containing more than 20% by weight water is not preferred because it is perishable.

The mannose-containing copra meal of the present invention may be used as feed by itself or in combination with other feed ingredients.

When mixed in formula feed, it is desirable to add the mannose-containing copra meal in an amount to give a mannose content in the formula feed from 0.001 to 0.6% by weight. Thus, the mannose-containing copra meal is typically added in an amount of 0.01-2% by weight, preferably 0.1-1% by weight, of the formula feed. The added amount of mannose-containing copra meal may usually be determined in the light of its potency and economical efficiency.

The process for producing mannose-containing copra meal of the present invention is described below.

The term "hemicellulase" used in the present invention refers to an enzyme which acts on hemicellulose, polysaccharides existing in plant cell wall in association with cellulose. Hemicellulase used in the present invention is not specifically restricted so far as it acts on copra meal to release mannose, and it includes mannan degrading enzymes such as mannanase (mannase) or mannosidase. Exemplary origins of such enzymes include, for example, grass bacillus (Bacillus subtilis), filamentous fungi (Aspergillus aculeatus, A. awamori, A. niger, A. usamii, Humicola insolens, Trichoderma harzianum, T. koningi, T. nongibrachiatum, T. viride), and basidiomycete (Coriticium, Pycnoporus coccineus), and those enzymes of Aspergillus origin are preferable. More preferably, mannanase derived from Aspergillus niger is used.

These hemicellulase are obtained in culture supernatant of the above described strains or in their cell bodies, and any fractions containing such hemicellulase may be used in the present invention. If necessary, the fraction containing hemicellulase may be purified or partially purified before use.

Alternatively, commercially available enzymes such as Cellulosin HC100, Cellulosin HC, Cellulosin TP25, Cellulosin GM5 (all manufactured by Hankyu Bio Industry), Sumizyme AC, Sumizyme ACH (all manufactured by Shin Nihon Kagaku Kogyo), and Gamanase (manufactured by Novo Nordisk Industry) may also be used.

Hemicellulase solution as used herein is not specifically restricted so far as it contains hemicellulase as described above, and it may be, for example, a solution in which such hemicellulase is suspended in water.

The amount of enzyme with which copra meal is treated is preferably 1-100 units per 1 gram of copra meal, and more preferably 10-50 units per 1 gram of copra meal. Preferably, the enzyme concentration is so adjusted that the required amount of enzyme solution may be 3-fold or less by weight relative to copra meal, and more preferably be 0.5- to 3-fold, particularly 1- to 2-fold. When more than 3-fold amount of enzyme solution is used, water content in the copra meal will so increase that propagation of various bacteria is promoted, and therefore the copra meal will be unsuitable as feed for use as such. In addition, said amount is unpreferable because it requires a lot of labor and costs to reduce

the water content to an appropriate value for use as feed. Although the amount less than 0.5-fold does not cause serious problems, such amount is not preferred since the amount of released mannose is not increased so much because the enzyme solution can not uniformly contact the copra meal.

Preferably, copra meal is brought into uniform contact with the enzyme solution by using a method, for example, in which the enzyme solution is added to copra meal and the mixture is immediately stirred, or in which copra meal is added into a container containing the enzyme solution and the mixture is immediately stirred, or in which copra meal is dispersed onto a flat surface and then the enzyme solution is uniformly sprayed thereover using any one of various atomizers. For industrial purpose, blenders such as kneader, ribbon mixer, and Nauta mixer (manufactured by Hosokawa Micron or Dalton) may be used.

Although conditions usually used for an enzymatic reaction may be acceptable, copra meal is preferably treated with the enzyme solution under the optimum conditions for the enzyme used. The reaction is preferably carried out under a temperature condition which does not inactivate the enzyme and which represses propagation of microorganisms in order to prevent rot of the reaction solution. Thus, the reaction temperature may be 20-90 °C, preferably 40-80 °C, and more preferably 50-75 °C. Although the reaction time depends on the amount of enzyme used, it is usually preferred in view of working efficacy to adopt a duration from 3 hours to 24 hours.

According to the present invention, it is preferred to dry the mannose-containing copra meal thus obtained until the water content reaches 5-20% by weight, and more preferably 5-13% by weight.

The feed may be dried by means of a vacuum dryer, vacuum agitating dryer, drum dryer, conveyor band dryer, flash dryer, fluidized bed dryer, or the like. The temperature during the drying process is suitably maintained at 60-140 °C and more preferably at 80-120 °C in order to repress propagation of various bacteria and not to decompose mannose.

EXAMPLES

The present invention is further illustrated by the following examples.

Example 1

To 100 g of copra meal (mannan content 30%, fat content 10%, water content 7.2%), 0.3 g of Cellulosin GM5 (mannanase manufactured by Hankyu Bio Industry; titer, 10,000 units/g) suspended in 100 ml of water (an equal amount by weight relative to copra meal) was uniformly sprayed and then incubated at 60 ℃ for 12 hours. After completion of the reaction, the product was vacuum-dried at 80 ℃ for 5 hours in a vacuum dryer (Vacuum Drying Oven DP32 manufactured by Yamato) to obtain a mannose-containing feed.

This feed was then suspended in water to dissolve sugar constituents in the feed into water, and the sugar constituents in the resulting solution were quantified using high performance liquid chromatography. For analysis, BioRad Aminex HPX-87P column was used at the column temperature of 85 ℃ and at the flow rate of 0.6 ml/min. Sugars were detected using a differential refractometer, and the mannose content was determined on the basis of the values obtained with authentic samples. In result, it was found that 13 g of mannose has been accumulated in 100 g of the feed. In addition, it was also found that the water content in the feed measured by heat-drying at normal pressure was 7.0%.

Example 2

To 100 g of copra meal (mannan content 30%, fat content 10%, water content 7.2%), 0.1 g of Sumizyme ACH (hemicellulase manufactured by Shin Nihon Kagaku Kogyo; titer, 50,000 units/g) suspended in 130 ml of water (a 1.3-fold amount by weight relative to copra meal) was uniformly sprayed and then incubated at 50 ℃ for 15 hours. After completion of the reaction, the product was vacuum-dried at 90 ℃ for 10 hours in a vacuum dryer (Vacuum Drying Oven DP32 manufactured by Yamato) to obtain a mannose-containing feed. Sugars in this feed were quantified in the same manner as described in Example 1, and it was found that 15 g of mannose has been accumulated in 100 g of the feed. It was also found that the water content was 6.5%.

Example 3

To 1 kg of copra meal (mannan content 30%, fat content 10%, water content 7.2%), 0.5 L of 1.8N HCl was added, and the mixture was stirred for 5 minutes using a

universal mixer (manufactured by Sanei Seisakusho). The pH of the mixture was 3.0. To this mixture, 0.5 g of Cellulosin GM5 (mannanase manufactured by Hankyu Bio Industry; titer, 10,000 units/g) and 0.5 g of Sumizyme ACH (hemicellulase manufactured by Shin Nihon Kagaku Kogyo; titer, 50,000 units/g) suspended in 1 L of water (an equal amount by weight relative to copra meal) were added, and mixed for 5 minutes. After mixing, the mixture was incubated at 60 ℃ for 24 hours. After completion of the reaction, the product was vacuum-dried at 100 ℃ for 10 hours in a vacuum dryer (Vacuum Drying Oven DP32 manufactured by Yamato) to obtain a mannose-containing copra meal. Sugars in this copra meal were quantified in the same manner as described in Example 1, and it was found that 11 g of mannose has been accumulated in 100 g of the copra meal. It was also found that the water content was 10.0%.

Performance evaluation of feed

Using the mannose-containing feed which contains mannose-containing copra meal prepared in Example 3, a salmonella excretion test was carried out in fowl.

Six white leghorn laying fowls (Julia) at 71-weeks old were fed ad libitum for 25 days with 0.1 kg/fowl/day (or a total feeding amount of 2.5 kg) of formula feed which has the composition shown below in the Table 1 supplemented with 1% by weight mannose-containing copra meal described above. On the 18th day after the feeding was started, 1 ml of bacterial suspension containing 8.0×10^5 cells/ml of salmonella (a wild strain of Salmonella enteritidis obtained from National Institute of Animal Health (Ministry of Agriculture, Forestry and Fisheries)) was orally administered by compulsion using catheter.

Table 1: Composition of the base feed

Material	Mix proportion (% by weight)
Yellow corn	69.4
Bean cake	16.0
CP 65% Fish meal	3.0
Alfalfa meal	2.0
DL-Methionine	0.1
L-Lysine hydrochloride [4)]	0.1
Calcium carbonate	6.5
Calcium monohydrogenphosphate	2.0
Sodium chloride	0.3
Trace mineral premix [1)]	0.2
Vitamin A, D, E premix [2)]	0.2
Vitamin B complex premix [3)]	0.2
Total	100

1) Mn 80 g, Zn 50 g, Fe 6 g, Cu 0.6 g, and I 1 g per kg

2) vitamin A 10,000 IU, vitamin D 32,000 IU, and vitamin E 20 mg per g

3) thiamine mononitrate 2.0 g, riboflavin 10.0 g, pyridoxine hydrochloride 2.0 g, nicotinamide 2.0 g, calcium D-pantothenate 4.35 g, choline chloride 138.0 g, and folic acid 1.0 g per kg

4) 98.5% preparation

Cecal feces excreted on the morning of the 14th day after the feeding was started (control) and of the 1st, 3rd, and 7th days after the salmonella administration were separately sampled for each individual, and the number of salmonellae was determined as described below.

For comparison, additional salmonella excretion tests were carried out in the same manner as described above with the exception that formula feed supplemented 1% of the copra meal without any enzymatic treatments (Reference Example 1) or only the base formula feed (Reference Example 2) was used in place of the above mannose-containing feed.

The results are shown in Fig. 1. In the figure, "a" indicates the number of salmonellae in cecal feces from fowls received the feed of the present invention, "b" indicates corresponding values for fowls received formula feed supplemented copra meal without any enzymatic treatments, and "c" indicates corresponding values for fowls

received only the base formula feed.

Fig. 1 shows the results of the salmonella excretion tests on fowl with the ordinate indicating the logarithmic value of the number of excreted salmonellae and the abscissa indicating the time after the salmonella administration in days.

The results indicate that the mannose-containing feed of the present invention has a salmonella-excreting effect.

<Method for measuring the number of salmonellae>

One gram of cecal feces was diluted 10-fold with sterilized phosphate buffered physiological saline and thoroughly mixed to give a stock solution. The stock solution was then diluted stepwise with a common ratio of 10 using sterilized physiological saline to prepare 100-fold and 1000-fold diluted solutions.

Each 0.1 ml of the stock solution, 100-fold and 1000-fold diluted solutions was inoculated separately onto SS agar plates and Brilliant Green agar plates, incubated at 37 ℃ for 24 hours, and then the typical colonies grown on each plate were measured. Furthermore, bacteria picked up from the colonies were inoculated on SIM Agar and TSI Agar (a modified Crigler medium used for verification of enterobacteria) for lysine decarboxylation test, and incubated at 37 ℃ for 24 hours to check their properties. The colony which was confirmed as salmonella was then checked for its serotype using salmonella antiserums. The number of salmonellae per 1 gram of the sample was then calculated by multiplying the number of colonies which were confirmed as Salmonella O9 group by the dilution ratio of the stock solution or the diluted solution.

The mannose-containing feed of the present invention is a useful feedstuff, since it contains mannose which is receiving attention as an ingredient for preventing salmonella infection.

In addition, since the feed according to the present invention is produced using copra meal as a raw material, the present invention is also useful as a solution for the industrial wastes problems.

Furthermore, according to the process of the present invention, such mannose-containing feed can be produced easily and at low cost.

CLAIMS

1. A mannose-containing copra meal characterized in that at least part of mannan in the copra meal has been degraded to mannose.

2. A mannose-containing copra meal of claim 1 which contains 3-30% by weight mannose.

3. A process for producing a mannose-containing copra meal, characterized in that copra meal is treated with a hemicellulase solution to release mannose.

4. A process for producing a mannose-containing copra meal of claim 3 wherein each 1 g of copra meal is treated with 1-100 units hemicellulase solution of a 3-fold or less amount by weight relative to copra meal.

5. A mannose-containing feed which contains the mannose-containing copra meal of claim 1.

6. A mannose-containing feed in which the mannose-containing copra meal of claim 2 accounts for 0.01-2% by weight of the whole feed.

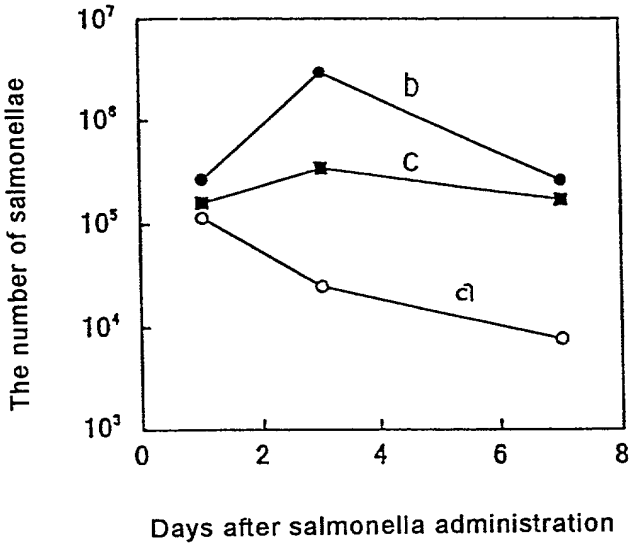
7. A mannose-containing feed which contains the mannose-containing copra meal produced by the process of claime 3.

8. A process for producing mannose-containing feed, characterized in that copra meal is treated with a hemicellulase solution of a 3-fold or less amount by weight relative to copra meal to release mannose.

Abstract

Mannose-containing copra meal characterized in that mannose in the copra meal has been degraded in whole or in part to mannose, a process for producing said copra meal and a mannose-containing feed which contains the mannose-containing copra meal.

Fig. 1


The number of salmonellae
10^7
10^6
10^5
10^4
10^3
0
2
4
6
8
b
c
a
Days after salmonella administration

DECLARATION AND POWER OF ATTORNEY FOR U.S. PATENT APPLICATION

(X) Original ( ) Supplemental ( ) Substitute ( ) PCT ( ) Design

As a below named inventor, I hereby declare that: my residence, post office address and citizenship are as stated below next to my name; that I verily believe that I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Title: Mannose-containing feed and process for producing the same

of which is described and claimed in:
( ) the attached specification, or
( ) the specification in the application Serial No. _____ filed _____;
and with amendments through _____ (if applicable), or
(X) the specification in International Application No. PCT/ JP98/03450, filed August 4, 1998, and as amended on _____ (if applicable).

I hereby state that I have reviewed and understand the content of the above-identified specification, including the claims, as amended by any amendment(s) referred to above.

I acknowledge my duty to disclose to the Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I hereby claim priority benefits under Title 35, United States Code, §119 (and §172 if this application is for a Design) of any application(s) for patent or inventor's certificate listed below and have also identified below any application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

COUNTRY	APPLICATION NO.	DATE OF FILING	PRIORITY CLAIMED
Japan	220319/1997	August 15, 1997	Yes

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not dislcosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application.

APPLICATION SERIAL NO.	U.S. FILING DATE	STATUS: PATENTED, PENDING, ABANDONED

And I hereby appoint John T. Miller, Reg. No. 21,120; Michael R. Davis, Reg. No. 25,134; Matthew M. Jacob, Reg. No. 25,154; Jeffrey Nolton, Reg. No. 25,408; Warren M. Cheek, Jr., Reg. No. 33,367; Nils E. Pedersen, Reg. No. 33,145 and Charles R. Watts, Reg. No. 33,142, who together constitute the firm of WENDEROTH, LIND & PONACK, L.L.P., attorneys to prosecute this application and to transact all business in the U.S. Patent and Trademark Office connected therewith.

I hereby authorize the U.S. attorneys named herein to accept and follow instructions from AOYAMA & PARTNERS as to any action to be taken in the U.S. Patent and Trademark Office regarding this application without direct communication between the U.S. attorneys and myself. In the event of a change in the persons from whom instructions may be taken, the U.S. attorneys named herein will be so notified by me.

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Full Name of Fourth Inventor	FAMILY NAME:	FIRST GIVEN NAME:	SECOND GIVEN NAME:
Residence & Citizenship	CITY:	STATE OR COUNTRY:	COUNTRY OF CITIZENSHIP:
Post Office Address	ADDRESS:	CITY:	STATE OR COUNTRY: ZIP CODE:

Full Name of Fifth Inventor	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME	
Residence & Citizenship	CITY	STATE OR COUNTRY	COUNTRY OF CITIZENSHIP	
Post Office Address	ADDRESS	CITY	STATE OR COUNTRY	ZIP CODE

Full Name of Sixth Inventor	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME	
Residence & Citizenship	CITY	STATE OR COUNTRY	COUNTRY OF CITIZENSHIP	
Post Office Address	ADDRESS	CITY	STATE OR COUNTRY	ZIP CODE

Full Name of Seventh Inventor	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME	
Residence & Citizenship	CITY	STATE OR COUNTRY	COUNTRY OF CITIZENSHIP	
Post Office Address	ADDRESS	CITY	STATE OR COUNTRY	ZIP CODE

I further declare that all statements made herein of my own knowledge are true, and that all statements on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

1st Inventor Genichi Yoshikawa Genichi YOSHIKAWA Date March 5, 1999

2nd Inventor Akemi Morimoto Akemi MORIMOTO Date March 5, 1999

3rd Inventor Muneniko Dombo Muneniko DOMBO Date March 5, 1999

4th Inventor _____ Date _____

5th Inventor _____ Date _____

6th Inventor _____ Date _____

7th Inventor _____ Date _____

The above application may be more particularly identified as follows:

U.S. Application Serial No. _____ Filing Date _____

Applicant Reference Number _____ Atty Docket No. _____

Title of Invention _____